

WHAT IS CLAIMED IS

Sub. D:8 1. A liquid crystal display device having a transparent first substrate, a transparent second substrate, and a liquid crystal layer and a color filter layer sandwiched between the first and second
5 substrates, comprising:

said color filter layer disposed on said first substrate;
said liquid crystal layer disposed between said color filter layer and said second substrate;

plural scan signal electrodes, video signal electrodes for
10 crossing said scan signal electrodes in a matrix form and plural thin film transistors formed in association with the crossing points between said scan signal electrodes and said video signal electrodes provided on said first substrate below said color filter layer;

15 at least one pixel formed in each of areas surrounded by said plural scan signal electrodes and said video signal electrodes;

each pixel provided with a common electrode which is connected over plural pixels through a common electrode wire to supply reference potential, and a pixel electrode which is connected to
20 the corresponding thin film transistor and disposed so as to confront said common electrode in said pixel area; and

said common electrode and said pixel electrode disposed between said color filter layer and said liquid crystal layer;

wherein said common electrode and said pixel electrode are
25 disposed in different layers through an interlayer separation film formed of a transparent insulating material, and

wherein electric field having a component which is dominantly parallel to said first substrate is produced in said liquid crystal

layer by applying a voltage across said common electrode and said pixel electrode, and liquid crystal before the voltage is applied thereto is orientated substantially in parallel to said first substrate.

5 2. The liquid crystal display device as claimed in claim 1, wherein at least one of said common electrode and said pixel electrode is formed of a transparent conductive film.

10 3. The liquid crystal display device as claimed in claim 1, wherein said common electrode is formed on said color filter layer, said interlayer separation film is formed on said common electrode, and said pixel electrode is formed on said interlayer separation film.

15 4. The liquid crystal display device as claimed in claim 1, wherein an overcoat layer for protecting said color filter layer is formed on said color filter layer, said common electrode is formed on said overcoat layer, said interlayer separation film is formed on said common electrode, and said pixel electrode is formed on said interlayer separation film.

20 5. The liquid crystal display device as claimed in claim 1, wherein an overcoat layer for protecting said color filter layer is formed on said color filter layer, said pixel electrode is formed on said overcoat layer, said interlayer separation film is formed on said pixel electrode, and said common electrode is formed on said interlayer separation film.

25 6. The liquid crystal display device as claimed in claim 1, wherein said common electrode is formed in a grid shape so as to surround a pixel; said pixel electrode is disposed so as to traverse the pixel; and said common electrode commonly uses a part

of said common electrode wire.

7. The liquid crystal display device as claimed in claim 1, wherein a plurality of said common electrodes and said pixel electrodes are arranged in the pixel.

5 8. The liquid crystal display device as claimed in claim 6, wherein said common electrode is formed so that the thin film transistor is hidden when viewed from the side of said second substrate.

9. The liquid crystal display device as claimed in claim 6,
10 wherein said common electrode is formed so that said scan signal electrodes and said video signal electrodes are hidden when viewed from the side of said second substrate.

10. A liquid crystal display device having a first substrate, a second substrate, and a liquid crystal layer and a color filter
15 layer sandwiched between the first and second substrates, comprising:

said color filter layer disposed on said first substrate;

said liquid crystal layer disposed between said color filter layer and said second substrate;

20 plural scan signal electrodes, video signal electrodes for crossing said scan signal electrodes in a matrix form and plural thin film transistors formed in association with the crossing points between said scan signal electrodes and said video signal electrodes provided on said first substrate below said color filter layer;

25 at least one pixel formed in each of areas surrounded by said plural scan signal electrodes and said video signal electrodes;

each pixel provided with a common electrode which is connected over plural pixels through a common electrode wire to supply

reference potential;

a pixel electrode which is connected to the corresponding thin film transistor disposed so as to confront said common electrode in said pixel area;

5 said common electrode and said pixel electrode disposed between said color filter layer and said liquid crystal layer;

 said common electrode and said pixel electrode disposed in different layers through an interlayer separation film formed of a transparent insulating material;

10 wherein electric field having a component which is dominantly parallel to said first substrate is produced in said liquid crystal layer by applying a voltage across said common electrode and said pixel electrode, and

 wherein liquid crystal before the voltage is applied thereto is
15 orientated substantially vertically to said first substrate.

11. The liquid crystal display device as claimed in claim 10,

 wherein at least one of said common electrode and said pixel electrode is formed of a transparent conductive film.

12. The liquid crystal display device as claimed in claim 10,

20 wherein said common electrode is formed on said color filter layer, said interlayer separation film is formed on said common electrode, and said pixel electrode is formed on said interlayer separation film.

13. The liquid crystal display device as claimed in claim 10,

25 wherein an overcoat layer for protecting said color filter layer is formed on said color filter layer, said common electrode is formed on said overcoat layer, said interlayer separation film is formed on said common electrode, and said pixel electrode is formed on said

interlayer separation film.

14. The liquid crystal display device as claimed in claim 10,
wherein an overcoat layer for protecting said color filter layer
is formed on said color filter layer, said pixel electrode is formed
5 on said overcoat layer, said interlayer separation film is formed
on said pixel electrode, and said common electrode is formed on said
interlayer separation film.

15. The liquid crystal display device as claimed in claim 10,
wherein said common electrode is formed in a grid shape so as
10 to surround a pixel; said pixel electrode is disposed so as to
traverse the pixel; and said common electrode commonly uses a part
of said common electrode wire.

16. The liquid crystal display device as claimed in claim 10,
wherein a plurality of said common electrodes and said pixel
15 electrodes are arranged in the pixel.

17. The liquid crystal display device as claimed in claim 15,
wherein said common electrode is formed so that the thin film
transistor is hidden when viewed from the side of said second
substrate.

20 18. The liquid crystal display device as claimed in claim 15,
wherein said common electrode is formed so that said scan signal
electrodes and said video signal electrodes are hidden when viewed
from the side of said second substrate.

25 19. The liquid crystal display device as claimed in claim 10,
wherein an optically negative compensation film and an
optically positive compensation film are disposed between said first
or second substrate and a polarizing plate to make anisotropy of
refractive index of said liquid crystal layer and said compensation

film isotropic.

20. The liquid crystal display device as claimed in claim 19,
wherein a pre-tilt angles are beforehand formed along two
directions in which liquid crystal molecules are felled when a
5 voltage is applied.

21. The liquid crystal display device as claimed in claim 19,
wherein a pre-tilt angle is beforehand formed in any one of
directions in which liquid crystal molecules are felled when a
voltage is applied.

10 22. The liquid crystal display device as claimed in claim 10,
wherein liquid crystal contains an organic polymer compound.

23. A method of manufacturing a liquid crystal display device
comprising a first substrate, a second transparent second substrate,
and a liquid crystal layer and a color filter layer sandwiched between
15 said first and second substrates, comprising the steps of:

forming said color filter layer on said first substrate;

forming said liquid crystal layer between said color filter
and said second substrate;

forming, on said first substrate below said color filter layer,
20 plural scan signal electrodes, plural video signal electrodes
crossing said scan signal electrodes in a matrix form, and plural
thin film transistors in association with the crossing points between
said scan signal electrodes and said video signal electrodes;

forming at least one pixel in each of areas surrounded by said
25 plural scan signal electrodes and said plural video signal
electrodes;

forming, in each pixel, a common electrode which is connected
over plural pixels through a common electrode wire to supply

reference potential, and a pixel electrode which is connected to the corresponding thin film transistor and disposed so as to confront said common electrode in said pixel area;

disposing said common electrode and said pixel electrode
5 between said color filter layer and said liquid crystal layer, and disposing said common electrode and said pixel electrode in different layers through an interlayer separation film formed of transparent insulating material;

forming liquid crystal so as to be oriented substantially
10 vertically to said first substrate when no voltage is applied across said common electrode and said pixel electrode; and

adding an organic material comprising monomers or oligomers into said liquid crystal, injecting said liquid crystal into the gap between said first substrate and said second substrate, and then
15 polymerizing said organic material in said liquid crystal.

24. A method of manufacturing a liquid crystal display device comprising a first substrate, a second transparent second substrate, and a liquid crystal layer and a color filter layer sandwiched between said first and second substrates, comprising the steps of:

20 forming said color filter layer on said first substrate;

forming said liquid crystal layer between said color filter and said second substrate;

forming, on said first substrate below said color filter layer, plural scan signal electrodes, plural video signal electrodes
25 crossing said scan signal electrodes in a matrix form, and plural thin film transistors in association with the crossing points between said scan signal electrodes and said video signal electrodes;

forming at least one pixel in each of areas surrounded by said

plural scan signal electrodes and said plural video signal electrodes;

forming, in each pixel, a common electrode which is connected over plural pixels through a common electrode wire to supply
5 reference potential, and a pixel electrode which is connected to the corresponding thin film transistor and disposed so as to confront said common electrode in said pixel area;

disposing said common electrode and said pixel electrode between said color filter layer and said liquid crystal layer, and
10 disposing said common electrode and said pixel electrode in different layers through an interlayer separation film formed of transparent insulating material; and

forming an optically negative compensation film and an optically positive compensation film between said first or second
15 substrate and a polarizing plate, and forming, by a rubbing method, pretilt angles along two directions in which liquid crystal molecules are felled when a voltage is applied to said compensation films.

25. A method of manufacturing a liquid crystal display device comprising a first substrate, a second transparent second substrate, and a liquid crystal layer and a color filter layer sandwiched between
20 said first and second substrates, comprising the steps of:

forming said color filter layer on said first substrate;

forming said liquid crystal layer between said color filter and said second substrate;

25 forming, on said first substrate below said color filter layer, plural scan signal electrodes, plural video signal electrodes crossing said scan signal electrodes in a matrix form, and plural thin film transistors in association with the crossing points between

said scan signal electrodes and said video signal electrodes;

forming at least one pixel in each of areas surrounded by said plural scan signal electrodes and said plural video signal electrodes;

5 forming, in each pixel, a common electrode which is connected over plural pixels through a common electrode wire to supply reference potential, and a pixel electrode which is connected to the corresponding thin film transistor and disposed so as to confront said common electrode in said pixel area;

10 disposing said common electrode and said pixel electrode between said color filter layer and said liquid crystal layer, and disposing said common electrode and said pixel electrode in different layers through an interlayer separation film formed of transparent insulating material;

15 forming liquid crystal so as to be oriented substantially vertically to said first substrate when no voltage is applied across said common electrode and said pixel electrode; and

forming an optically negative compensation film and an optically positive compensation film between said first or second
20 substrate and a polarizing plate, and forming, by a rubbing method, a pretilt angle in any one of directions in which liquid crystal molecules are felled when a voltage is applied to said compensation films.

26. A method of manufacturing a liquid crystal display device
25 comprising a first substrate, a second transparent second substrate, and a liquid crystal layer and a color filter layer sandwiched between said first and second substrates, comprising the steps of:

forming said color filter layer on said first substrate;

forming said liquid crystal layer between said color filter and said second substrate;

forming, on said first substrate below said color filter layer, plural scan signal electrodes, plural video signal electrodes
5 crossing said scan signal electrodes in a matrix form, and plural thin film transistors in association with the crossing points between said scan signal electrodes and said video signal electrodes;

forming at least one pixel in each of areas surrounded by said plural scan signal electrodes and said plural video signal
10 electrodes;

forming, in each pixel, a common electrode which is connected over plural pixels through a common electrode wire to supply reference potential, and a pixel electrode which is connected to the corresponding thin film transistor and disposed so as to confront
15 said common electrode in said pixel area;

disposing said common electrode and said pixel electrode between said color filter layer and said liquid crystal layer, and disposing said common electrode and said pixel electrode in different layers through an interlayer separation film formed of transparent
20 insulating material;

forming liquid crystal so as to be oriented substantially vertically to said first substrate when no voltage is applied across said common electrode and said pixel electrode; and

forming an optically negative compensation film and an
25 optically positive compensation film between said first or second substrate and a polarizing plate, and forming, by light irradiation, pretilt angles in two directions in which liquid crystal molecules are felled when a voltage is applied to said compensation films.

27. A method of manufacturing a liquid crystal display device comprising a first substrate, a second transparent second substrate, and a liquid crystal layer and a color filter layer sandwiched between said first and second substrates, comprising the steps of:

5 forming said color filter layer on said first substrate;
 forming said liquid crystal layer between said color filter
and said second substrate;

 forming, on said first substrate below said color filter layer,
plural scan signal electrodes, plural video signal electrodes
10 crossing said scan signal electrodes in a matrix form, and plural
thin film transistors in association with the crossing points between
said scan signal electrodes and said video signal electrodes;

 forming at least one pixel in each of areas surrounded by said
plural scan signal electrodes and said plural video signal
15 electrodes;

 forming, in each pixel, a common electrode which is connected
over plural pixels through a common electrode wire to supply
reference potential, and a pixel electrode which is connected to
the corresponding thin film transistor and disposed so as to confront
20 said common electrode in said pixel area;

 disposing said common electrode and said pixel electrode
between said color filter layer and said liquid crystal layer, and
disposing said common electrode and said pixel electrode in different
layers through an interlayer separation film formed of transparent
25 insulating material;

 forming liquid crystal so as to be oriented substantially
vertically to said first substrate when no voltage is applied across
said common electrode and said pixel electrode; and

forming an optically negative compensation film and an optically positive compensation film between said first or second substrate and a polarizing plate, and forming, by light irradiation, a pretilt angle in any one of directions in which liquid crystal molecules are felled when a voltage is applied to said compensation films.

28. The method as claimed in claim 26, wherein the light irradiation to forming the pretilt angles is conducted on the surfaces of said compensation films from a slant direction.

29. The method as claimed in claim 28, wherein the light irradiation for forming the pretilt angles is conducted by irradiating polarized light the surfaces of said compensation films from a slant direction.

30. The method as claimed in claim 27, wherein the light irradiation for forming the pretilt angle is conducted on the surfaces of said compensation films from a slant direction.

31. The method as claimed in claim 28, wherein the light irradiation for forming the pretilt angles is conducted by irradiating polarized light on the surfaces of said compensation films from a slant direction.

32. A method of manufacturing a liquid crystal display device comprising the steps of:

forming a thin film on a transparent substrate;

forming a passivation film for protecting said thin film transistor;

successively coating, light-exposing, developing and baking plural photosensitive color resists to form a color filter;

forming a common electrode; and

forming an interlayer separation film of a transparent insulating film.

33. A method of manufacturing a liquid crystal display device comprising the steps of:

- 5 forming a thin film on a transparent substrate;
 forming a passivation film for protecting said thin film transistor;
 successively coating, light-exposing, developing and baking plural photosensitive color resists to form a color filter;
10 forming an overcoat film for protecting said color filter;
 forming a common electrode; and
 forming an interlayer separation film of a transparent insulating film.

34. The liquid crystal display device as claimed in claim 33,

- 15 wherein said common electrode is formed in a grid shape so as to surround a pixel; said pixel electrode is disposed so as to traverse the pixel; and said common electrode commonly uses a part of said common electrode wire.

35. The liquid crystal display device as claimed in claim 33,

- 20 wherein a plurality of said common electrodes and said pixel electrodes are arranged in the pixel.

36. The liquid crystal display device as claimed in claim 34,

- wherein said common electrode is formed in a grid shape so as to surround a pixel; said pixel electrode is disposed so as to traverse the pixel; and said common electrode commonly uses a part
25 of said common electrode wire.

37. The liquid crystal display device as claimed in claim 34,

- wherein a plurality of said common electrodes and said pixel

electrodes are arranged in the pixel.

38. The liquid crystal display device as claimed in claim 35,

wherein said common electrode is formed in a grid shape so as to surround a pixel; said pixel electrode is disposed so as to
5 traverse the pixel; and said common electrode commonly uses a part of said common electrode wire.

39. The liquid crystal display device as claimed in claim 35,

wherein a plurality of said common electrodes and said pixel electrodes are arranged in the pixel.
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